PATENT ABSTRACTS OF JAPAN

(11)Publication number : 11-127211
(43)Date of publication of application : 11.05.1999

(51)Int.CI. H04L 27/38
H03J 5/00
H04B 1/26
H04L 27/22
H04N 5/44
H04N 7/16

(21)Application number : 09-291937
(22)Date of filing : 24.10.1997

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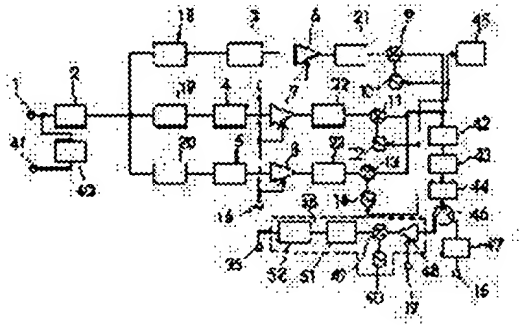
(54) TUNER FOR CABLE MODEM

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a tuner for a cable modem that is equipped with a digital signal conversion circuit for converting to a baseband signal of a QAM or the like and is especially suitable to a set top box.
SOLUTION: A tuner for cable modem incorporates into one case body an upstream circuit 40 for transmitting an incoming data signal to a CATV station and the below mentioned structure for receiving an outgoing signal led through by way of a high pass filter 2 for eliminating the incoming data signal. The device has selection circuits 18 to 20 for selectively outputting an input received signal to three systems according to a frequency band, high frequency amplification input tuning circuits 3 to 5 for tuning to a desired frequency, high frequency amplifier circuits 6 to 8 for amplifying signals next, high frequency amplification output tuning circuits 21 to 23 for tuning to the desired frequency, frequency conversion circuits 9 to 14 and 45 for



converting to a desired intermediate frequency, an intermediate frequency amplifier circuit 43 for amplifying the signal thereafter, and a digital signal conversion circuit 58 for converting to a specified baseband signal at the final stage.

LEGAL STATUS

[Date of request for examination] 30.01.2004

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the tuner for cable modems.
[0002]
[Description of the Prior Art] In cable television (it is called Following CATV), the service wire to a home is left the coaxial cable, and installation of HFC (Hybrid Fiber/Coax) which optical-fiber-ized the trunk network is advanced. It is for providing the home with the broadband data transmission services of several M bits per seconds, and a transmission-speed 30M bit per second high-speed data line can be made also from 64QAM (Quadrature Amplitude Modulation) which is not advanced technology any longer with the bandwidth of 6MHz. A cable modem is used for this. 4M bit-per-second -27M bit per second high-speed data transmission is realizable using the empty channel of cable television.
[0003] Drawing 12 is the block diagram of the conventional example of the tuner for cable modems. The going-down signal with which the going-up signal transmitted towards a station side about a CATV signal is transmitted towards the tuner for cable modems from a 5MHz - 42MHz and station side is employed in 54MHz - 860MHz, and is connected to the circuit of a cable through the input terminal 111 of a tuner. It is received by the data receiver of a CATV station (system operator), and the going-up signal transmitted from a cable modem goes into the computer of a pin center,large. Moreover, about the going-up signal inside a cable modem, the data signal by which the rectangular phase displacement modulation (QPSK) was carried out to the data terminal 110 for example, from the QPSK (Quadrature Phase Shift Keying) transmitter is introduced. This data signal is further transmitted to a CATV station through the CATV input terminal 111 through the upstream circuit 109.

[0004] The data signal which it got down and was received in the CATV station about the signal is sent out to a cable circuit for example, after a 64QAM modulation, and it goes into a cable modem through the CATV input terminal 111. Inside a modem, the signal of choice is tuned in with a tuner, MPEG playback after a 64QAM recovery is performed, and the data signal processed in CPU is derived to the computer connected to the modem.
[0005] By the way, processing of the going-down signal inside a tuner is as follows. The going-down signal inputted into the CATV input terminal 111 is changed into the first intermediate frequency of 950MHz by the first mixing circuit 102 and the First Bureau section oscillator circuit 107 after passing the wideband amplifier 101. Microcomputer control of the channel selection is carried out by the PLL channel selection circuit 113 in the First Bureau section oscillator circuit 107. The IF signal (elliptic trochoidal wave signal) changed into the first intermediate frequency is amplified in the first intermediate frequency amplifying circuit 104, after alignment is taken in the first intermediate frequency magnification input tuning circuit 103, and after a channel selection is performed in the first intermediate frequency output tuning circuit 105, it is introduced into the second mixing circuit 106.

[0006] In the second mixing circuit 106, it changes into the second intermediate frequency signal by the Second Bureau section oscillator circuit 108, and the changed second intermediate frequency signal is derived to the IF output terminal 112. PLL control of the Second Bureau section oscillator circuit 108 is carried out in the PLL channel selection circuit 113 as well as the First Bureau section oscillator circuit 107. As for the second intermediate frequency, 44MHz is usually applied. A 64QAM recovery is carried out and the second intermediate frequency drawn from a tuner output terminal is drawn as a data signal after MPEG processing, after being changed into 5MHz baseband and carrying out A/D conversion further after this.

[0007]

[Problem(s) to be Solved by the Invention] In order for the tuner for cable modems to always perform standby reception, a low power is required, but in the tuner for cable modems of the above-mentioned conventional double conversion method, it is necessary to prevent interference of each circuit, and while performing the housing design which makes severe shielding structure electrically, air clearance must be established, the chassis design which mitigates interference further must be performed, and an appearance configuration becomes large. Moreover, it becomes easy to generate local spurious active jamming by interference between each local oscillation circuit, and a communication link error tends to take place. Therefore, the circuit changed into baseband signaling was not contained by the same housing.

[0008] Moreover, with the television set, the tuner for a channel selection was formed the object for digital signals, and for analog signals on this television set as another object by the so-called set top box deferred as a receiver, respectively. However, now, since the circuit of the same kind was established in the duplex, circuitry had much futility and it had become enlargement of a set top box, and the cause of an expensive rank.

[0009] This invention solves the above-mentioned technical problem, and it has the digital signal conversion circuit changed into baseband signaling, such as QAM, and aims at offering the tuner for cable modems suitable for a set top box etc.

[0010]

[Means for Solving the Problem] The upstream circuit for sending out the data signal for the going-up circuits to a CATV station in this invention, in order to attain the above-mentioned purpose, Are considering as the tuner for cable modems characterized by building the next configuration for [which was drawn through the high-pass filter from which the data signal for the above-mentioned going-up circuits is removed] getting down and receiving a signal in one housing. (1) The selection circuitry which carries out the selection output of the input input signal of many waves by the frequency band at at least two lines, (2) The RF magnification input tuning circuit which aligns with a desired frequency each input signal which carried out the selection output in each network, respectively by the above-mentioned selection circuitry, (3) The RF amplifying circuit which amplifies the output signal of each above-mentioned RF magnification input tuning circuit in each network, respectively, (4) The RF magnification output tuning circuit which aligns the output signal of each above-mentioned RF amplifying circuit with a desired frequency in each network, respectively, (5) The frequency changing circuit which changes the output of each above-mentioned RF magnification output tuning circuit into the signal of a desired intermediate frequency in each network, (6) The intermediate frequency amplifying circuit which amplifies the input signal which carried out frequency conversion in each above-mentioned frequency changing circuit, digital signal conversion circuit which changes the output of the (7) above-mentioned intermediate frequency amplifying circuit into predetermined baseband signaling.

[0011] Therefore, the data signal for uphill circuits outputted from the tuner for cable modems is sent out through an upstream circuit to a CATV station, and it gets down from a CATV station, and it goes up with a high-pass filter, the data signal for circuits is removed, and the data signal for circuits is inputted into a selection circuitry. In this selection circuitry, the signal by which carried out the

selection output of the input signal at the network [like] which are for example, a VHF low band, a VHF high band, and a UHF band, and which is prepared partly, respectively, and the selection input was carried out in each network goes into a RF magnification input tuning circuit, and derives the signal which aligned with the signal of a desired frequency here.

[0012] After each drawn signal is amplified in each network after that in a RF amplifying circuit, it is supplied to a RF magnification output tuning circuit, respectively, and has the signal which aligned with the desired frequency here taken out. And the frequency changing circuit of the next step is supplied and it is changed into the signal of an intermediate frequency. A frequency changing circuit consists of a mixing circuit and a local oscillation circuit. The input signal changed into the signal of an intermediate frequency is amplified after that in an intermediate frequency amplifying circuit.

[0013] Furthermore, this signal is inputted into a digital signal conversion circuit, and is changed into predetermined baseband signaling. In the case of the tuner for cable modems for for example, a QAM recovery, a digital signal conversion circuit is a down converter, at this time, the signal of an intermediate frequency is reduced in a frequency and the baseband signaling for a QAM recovery is outputted. Moreover, when the tuner for cable modems is an object for a QPSK recovery, a digital signal conversion circuit is an IQ demodulator circuit, and outputs the I signal (synchronous component signal) and Q signal (orthogonal component signal) for a QPSK recovery.

[0014] Moreover, in this invention, in the above-mentioned configuration, the distributor was inserted between connections with said intermediate frequency amplifying circuit and said digital signal conversion circuit, and the terminal which takes out an analog elliptic trochoidal wave signal from said distributor is prepared.

[0015] According to such a configuration, when an input signal is an analog signal, an intermediate frequency signal can be taken out from a distributor. Moreover, in the case of a digital signal, it is convertible for baseband signaling predetermined by the digital signal conversion circuit as mentioned above. Therefore, in this tuner for cable modems, both an analog intermediate frequency signal and digital baseband signaling can be outputted.

[0016] Moreover, in the above-mentioned configuration, said housing is formed with a conductor, said interior of a housing is divided with this invention into two or more dens by the septum of a conductor, and said digital signal conversion circuit is made to be arranged with said frequency changing circuit in another room in it.

[0017] The interior is divided with such a configuration for a housing by septa, such as a metal, and some dens are prepared with it. And the frequency changing circuit and the digital signal conversion circuit are arranged so that it may become another room. Thereby, said frequency changing circuit and digital signal conversion circuit are covered electromagnetic, and have shielding structure which interference does not produce. Therefore, local spurious one is reduced sharply and can make a digital signal conversion circuit build in the same housing with a frequency changing circuit etc.

[0018] Moreover, in this invention, in the above-mentioned configuration, said housing consists of a chassis and a shielding lid, and the height pushed out toward the interior of said housing is prepared in the location which faces said den by which said digital signal conversion circuit has been arranged about said shielding lid.

[0019] The interior of a chassis is partitioned off with such a configuration by the den, and the circuit of each part is arranged with it at these. And it is covered with the shielding lid formed with the conductor. In the den by which the digital signal conversion circuit is arranged among each part stores, internal space is further narrowed by the height like a flat-spring configuration prepared in the shielding lid, and has heightened the shielding effect, for example by it.

[0020]

[Embodiment of the Invention]

The 1st operation gestalt of <operation gestalt of ** 1st> this invention is explained. Drawing 1 is the block diagram of this operation gestalt. The tuner for cable modems of this operation gestalt is a tuner

for cable modems suitable for being used for the so-called set top box, and can output the baseband signaling for a QAM recovery. Usually, a set top box is deferred as a receiver in the upper part of a television set, and performs a channel selection from the analog which received through the cable, or a digital signal.

[0021] And an analog elliptic trochoidal wave signal or the baseband signaling for a QAM recovery is transmitted to a television set. In a television set, image detection etc. is processed in response to these signals, and playback of an image etc. is performed. On the contrary, a set top box is intervened and used between a CATV station and a television set, also when transmitting data to a CATV station.

[0022] In the tuner for cable modems, the data signal by which the QPSK modulation was carried out, for example is supplied to the going-up signal inputted from the data terminal 41 by the CATV input terminal 1 through the upstream circuit 40, and it is sent out towards a CATV station. On the other hand, the going-down signal inputted from the CATV input terminal 1 goes into the input selection circuitries 18, 19, and 20 after passing a high-pass filter 2, and is switched to each circuit of a UHF band, VHF and a HIGH band, and a VHF and a LOW band. [0023] 5-46MHz is a decay area, and a high-pass filter 2 is a filter of the property which makes 54MHz or more a pass band. Although 170-470MHz and a VHF-LOW band point [the above-mentioned UHF band] out 54-170MHz in 470-860MHz and a VHF-HIGH band, especially the range is not specified. The approach of switching generally according [the input selection circuitries 18, 19, and 20] to a switching diode or the approach of switching with the filter by band division is used. With this operation gestalt, the approach of switching by the switching diode is adopted.

[0024] Each above-mentioned band will be in operating state according to a receiving channel respectively, and other bands serve as the function in which it does not operate. For example, at the time of channel reception of a UHF band, the input selection circuitry 18, the RF magnification input tuning circuit 3, the high-frequency amplifier 6, the RF magnification output tuning circuit 21, the mixing circuit 9, and the local oscillation circuit 10 of UHF band system ** will be in operating state. A VHF-HIGH band, the input selection circuitries 19 and 20 of VHF-LOW band system **, the RF magnification input tuning circuits 4 and 5 and high-frequency amplifier 7 and 8, the RF magnification output tuning circuits 22 and 23, mixing circuits 11 and 13, and the local oscillation circuits 12 and 14 suspend actuation.

[0025] The input selection circuitry 19, the RF magnification input tuning circuit 4, the high-frequency amplifier 7, the RF magnification output tuning circuit 22, the mixing circuit 11, and the local oscillation circuit 12 of VHF-HIGH band system ** will be in operating state similarly at the time of reception of VHF and a HIGH band. A UHF band, the input selection circuitries 18 and 20 of VHF-LOW band system **, the RF magnification input tuning circuits 3 and 5 and high-frequency amplifier 6 and 8, the RF magnification output tuning circuits 21 and 23, mixing circuits 9 and 13, and the local oscillation circuits 10 and 14 suspend actuation.

[0026] Moreover, the input selection circuitry 20, the RF magnification input tuning circuit 5, the high-frequency amplifier 8, the RF magnification output tuning circuit 23, the mixing circuit 13, and the local oscillation circuit 14 of VHF and LOW band system ** will be in operating state at the time of reception of a VHF-LOW band. A UHF band, the input selection circuitries 18 and 19 of VHF-HIGH band system **, the RF magnification input tuning circuits 3 and 4 and high-frequency amplifier 6 and 7, the RF magnification output tuning circuits 21 and 22, mixing circuits 9 and 11, and the local oscillation circuits 10 and 12 suspend actuation.

[0027] Common circuits other than the circuit concerning above-mentioned band system ** of upstream circuit 40 grade will always be in operating state regardless of a band switch. And this the actuation of a series of takes place in connection with channel selection data being sent out to the PLL channel selection circuit 45. If a channel channel selection is performed based on the above-mentioned channel selection data, according to the band information tuned in to this and coincidence, the input selection circuitries 18, 19, and 20 will operate, and a switch of the current supply to the circuit of each

network will be performed.

[0028] Next, actuation of each band is explained. After passing a high-pass filter 2 so that the CATV signal inputted into an input terminal 1 may be mentioned above, it goes into the input selection circuitries 18, 19, and 20, and a switch of a band is performed. And the output is led to the high frequency magnification input tuning circuits 3, 4, and 5, respectively, and the channel selection of a channel is performed. After the signal with which the channel channel selection was performed is amplified based on the AGC electrical potential difference inputted from the RF AGC terminal 16 with high-frequency amplifier 6, 7, and 8, it is supplied to the RF magnification output tuning circuits 21, 22, and 23, and derives an input signal here.

[0029] Then, the selected input signal is changed into an intermediate frequency signal in mixing circuits 9, 11, and 13 and the local oscillation circuits 10, 12, and 14, and after it is amplified in the intermediate frequency amplifying circuit 42 and passes the SAW (Surfase Acoustic Wave) filter 43, it is amplified again in the intermediate frequency amplifying circuit 44.

[0030] And the intermediate frequency signal outputted from the intermediate frequency amplifying circuit 44 is outputted from an output terminal 15 through the buffer amplifier (amplifying circuit) 47, when the signal inputted into an input terminal 1 is an analog signal. On the other hand, when the signal inputted into an input terminal 1 is a signal by which the QAM modulation was carried out, a frequency is reduced with the down converter 58 as a digital signal conversion circuit from a distributor 46, and it is changed into the baseband signaling for a QAM recovery, and is outputted from an output terminal 35.

[0031] In a down converter 58, first, a distributor 46 to a digital signal amplifies according to the AGC electrical potential difference inputted from the intermediate frequency AGC terminal 17 in the 2nd intermediate frequency amplifying circuit 48, and is inputted into a mixing circuit 49. In a mixing circuit 49, it mixes using the oscillation signal from the local oscillation circuit 50. The local oscillation circuit 50 is a fixed oscillator circuit by the quartz resonator, and does not carry out PLL control like the local oscillation circuits 10, 12, and 14 changed into an intermediate frequency.

[0032] And the low pass filter 51 of the next step is inserted for the rejection ratio improvement of the oscillation signal leakage and image signal from the local oscillation circuit 50. Finally, this signal is amplified with the postamplifier (amplifying circuit) 52, and is outputted as an object for a QAM recovery from a terminal 18.

[0033] It is not necessary to prepare the circuit for other reception etc., and an analog elliptic trochoidal wave signal and the baseband signaling for a QAM recovery can be given to a television set by having this tuner for cable modems in the above-mentioned set top box. In a television set, the signal for AGC control is outputted to a set top box by QAM recovery. In a set top box, it leads to the AGC terminal of the tuner for cable modems, and AGC control is performed. Moreover, when the going-up signal to a CATV station also tells a set top box from a television set, sending out of the signal is performed.

[0034] Next, the housing which contains each above-mentioned circuit is explained. In the former, since there was a local spurious problem, a down converter 58 was not built in the same housing as a tuner circuit. However, it is possible for local spurious one to be reduced and to build a down converter 58 in the same housing by using a housing which is explained to the following which consists of a chassis and a shielding lid.

[0035] Drawing 2 is the top view of the chassis. In addition, drawing 3 is the rear view of the chassis, and drawing 4 is an A-A sectional view. This chassis is formed with conductors, such as a metal. And it is partitioned off by the septum by the conductor inside, and each circuit which constitutes the tuner for cable modems is arranged in each part store so that it may explain below.

[0036] The upstream circuit 40 is stored in a den 60. A high-pass filter 2 is stored in a den 61. The input selection circuitries 18, 19, and 20 are stored in the corner 62 of the den which consists of 62 and 63. The RF amplifying circuits 3-5 are stored in the corner 63 of the den. High-frequency amplifier 6-8

is stored in the corner 64 of the den which consists of 64 and 66. The RF magnification output tuning circuit 22 is stored in the corner 66 of the den.

[0037] The RF magnification output tuning circuit 21 is stored in the RF magnification output tuning circuit 23 and a den 67 at a den 65. The intermediate frequency amplifying circuit 42, SAW filter 43, the intermediate frequency amplifier 44, a distributor 46, and the buffer amplifier 47 are stored in a den 68. Mixing circuits 9, 11, and 13, the local oscillation circuits 10, 12, and 14, and the PLL channel selection circuit 45 are stored in a den 69. Each circuit of a down converter 58 is stored in a den 70. In addition, in case a part 71 is equipped with this chassis in a set top box, it is bearing a role of a guide.

[0038] Thus, dens 69 and 70 are divided with the septum of a conductor, and the local oscillation circuits 10, 12, and 14 (refer to drawing 1) and the local oscillation circuit 50 (refer to drawing 1) are mutually stored in another room. Therefore, since electromagnetic electric shielding is made by the septum, it is possible for local spurious one to be reduced and to prepare in the same housing.

[0039] Drawing 3 is the rear view of this chassis. 69 is a fastener formed along the side face of a chassis. [two or more] 80 is the insertion section prepared along the side face of a chassis, and also has the duty which reinforces the chassis concerned. [two or more] Moreover, some stomata for wiring are prepared.

[0040] For example, a terminal 41 (refer to drawing 1) is formed in a stoma 74, and it is used in order to input the going-up signal from a television set. The RF AGC terminal 16 (refer to drawing 1) is formed in a stoma 76. An output terminal 15 (refer to drawing 1) is formed in a stoma 75. In a stoma 77, the intermediate frequency AGC terminal 17 (refer to drawing 1) is formed. The output terminal 35 (refer to drawing 1) is formed in the stoma 78.

[0041] The A-A cross section in drawing 1 is shown in drawing 4 . It is divided with the conductor and each den gives the same sign to drawing 2 and a corresponding den. The description is in the place where the den 69 in which especially the local oscillation circuits 10, 12, and 14 are stored, and the den 70 in which the local oscillation circuit 70 is stored serve as another room.

[0042] It is shown in drawing 5 , using as a B-B cross section (refer to drawing 1) the septum with which dens 69 and 70 are divided. Since the local oscillation circuits 10, 12, and 14 are covered by such partition electromagnetic with the local oscillation circuit 50, local spurious one is reduced without producing interference.

[0043] Drawing 6 is the top view of the shielding lid of the housing concerned. The shielding lid as well as the above-mentioned chassis is formed with conductors, such as a metal. The part shown in 81 is located in the location which faces a den 70, and as shown in drawing 8 , the flat-spring configuration which pushed out inside is carried out, and by this, the configuration of a C-C cross section narrows space inside a den, and has heightened the effectiveness of electric shielding. In addition, not only in a flat-spring configuration but generally the height is prepared like this operation gestalt, and equivalent effectiveness will be acquired, if it is constituted so that the space of the room may be narrowed.

[0044] Drawing 7 is the front view of a shielding lid. Two or more formation of the projection object 82 for installation with a chassis is carried out in the periphery of a shielding lid. These are prepared in the whole at almost fixed spacing along the periphery of a shielding lid, and if it sees from a side face, the configuration is bent by the typeface of "**" as shown in 83. Sealing electromagnetic about the circuit of each part is made by each den of a chassis with the shielding lid.

[0045] Drawing 9 is the modification of an above-mentioned shielding lid. About the part shown in 85, the C-C cross section serves as a flat-spring configuration as shown in drawing 8 . Therefore, there is effectiveness equivalent to the shielding lid shown in drawing 6 . Moreover, two or more insertion sections 86 are formed in this shielding lid, and improvement in the effectiveness of electromagnetic electric shielding is aimed at. The enlarged drawing of the insertion section 86 is shown in drawing 10 .

[0046] It is the configuration to which width of face becomes narrow as are shown in drawing 10 (a) and width of face separates in the distance most widely by the bond part 90 one by one, and as shown

in drawing 10 (b), it is inserted in inside the case. He narrows space inside a housing and is trying to reduce local spurious one further by this. In addition, in drawing 9 , stomata 87 and 88 have opened in the shielding lid, and it can use as a screw hole for attaching the housing of the tuner for cable modems in a set top box.

[0047] Since it is considering as the structure which divided the interior of a housing into the den and took local spurious measures according to this operation gestalt as explained above, it can consider as the tuner for cable modems having a down converter 58 (refer to drawing 1). Thereby, in an above-mentioned set top box, only by having this tuner for cable modems, even if it does not prepare other circuits etc., according to the input of an analog to digital, an analog intermediate frequency signal or the baseband signaling for a QAM recovery can be taken out.

[0048] When equipping a set top box with the tuner for cable modems of this operation gestalt, the signal inputted into the AGC terminals 16 and 17 is an AGC electrical potential difference sent from the circuit performed [recovery / QAM] with the television set connected to the set top box. Thus, especially the tuner for cable modems of this operation gestalt fits the set top box.

[0049] <The 2nd operation gestalt>, next the 2nd operation gestalt of this invention are explained. Drawing 11 is the block diagram of this operation gestalt. Although the operation gestalt of the above 1st was a circuit for a QAM recovery, with the 2nd operation gestalt, the configuration which built in the IQ demodulator circuit 59 for a QPSK recovery as a digital signal conversion circuit is carried out. The IQ demodulator circuit 59 outputs an I signal (synchronous component signal) and the baseband signaling of a Q signal (orthogonal component signal) for the signal inputted from a distributor 46.

[0050] Since the circuit except the IQ demodulator circuit 59 of a circuit is the same as the circuit except the down converter 58 in the operation gestalt (drawing 1) of the above 1st, in drawing 2 , the sign same about these parts as drawing 1 is attached, and explanation is omitted.

[0051] One side of the output of a distributor 46 is sent to the output terminal 15 of an analog intermediate frequency signal from the buffer amplifier 47, and another side is sent to the IQ demodulator circuit 59. In the IQ demodulator circuit 59, the signal from a distributor 46 is amplified in the intermediate frequency amplifying circuit 48 according to the AGC electrical potential difference into which it is first inputted by the AGC terminal 17. And the output of the intermediate frequency amplifying circuit 48 is inputted into mixing circuits 49 and 53. Moreover, in the IQ demodulator circuit 59, the local oscillation circuit 50 is formed and the signal oscillated from the local oscillation circuit 50 turns into two sorts of signals with which the phase shifted pi/2 (90 degrees) mutually in the phase circuit 56.

[0052] And each signal from the phase circuit 56 is inputted into mixing circuits 49 and 53, respectively. As for the output of mixing circuits 49 and 53, the improvement of the rejection ratio of the oscillation signal leakage and image signal of the local oscillation circuit 50 is made with low pass filters 51 and 54, respectively. Thereby, conversion to an I signal and the baseband signaling of a Q signal is performed. And the output of low pass filters 51 and 54 is amplified with the postamplifier 52 and 55, respectively, and the I signal and Q signal for a QPSK recovery are outputted from output terminals 36 and 37.

[0053] The housing which contains the circuit of this operation gestalt can use the housing (drawing 2 - drawing 10) explained with the operation gestalt of the above 1st. If the chassis shown in drawing 2 about the circuit arrangement in that case explains, in 60-69, such as a den, it is the same arrangement as the operation gestalt of the above 1st. And the circuit of each part of the IQ demodulator circuit 59 is stored in a den 70.

[0054] Thereby, since it is another room and local spurious one is reduced, even if the den 69 by which the local oscillation circuits 10, 12, and 14 have been arranged, and the den 70 by which the local oscillation circuits 49 and 53 were contained store the IQ demodulator circuit 59 in the housing of the tuner for cable modems, it can be used satisfactory. In addition, it cannot be overemphasized that the case where it is shown in drawing 6 etc., the case where it is shown in drawing 9 etc., and anything of a

shielding lid are also usable.

[0055]

[Effect of the Invention]

According to invention which relates to claim 1 as explained beyond <the effectiveness of claim 1>, since the tuner for cable modems contains the digital signal conversion circuit changed into baseband signaling, such as QAM, from an intermediate frequency signal in one housing, the baseband signaling for for example, a QAM recovery can be outputted from the tuner for cable modems, and this can be immediately inputted into a television set etc.

[0056] According to invention concerning <the effectiveness of claim 2>, and claim 2, the digital signal conversion circuit serves as a down converter, and the baseband signaling for a QAM recovery is outputted by frequency conversion from the tuner for cable modems.

[0057] According to invention concerning <the effectiveness of claim 3>, and claim 3, the digital signal conversion circuit is IQ demodulator circuit, and can output the I signal and Q signal for a QPSK recovery from the tuner for cable modems.

[0058] The tuner for <effectiveness of claim 4> cable modems can change both an analog signal and a digital signal into an intermediate frequency signal. In the case of an analog signal, an analog intermediate frequency signal can be taken out from a distributor. On the other hand, a digital elliptic trochoidal wave signal is changed into the signal for a recovery by the digital signal conversion circuit as mentioned above.

[0059] The <effectiveness of claim 5> housing is formed with the conductor, and the interior is partitioned off by the den. Furthermore, since the digital signal conversion circuit is arranged with the frequency changing circuit for intermediate frequency generation in another room, electromagnetic electric shielding is achieved. Therefore, local spurious one is reduced and a digital signal conversion circuit can be stored in the same housing satisfactory.

[0060] A <effectiveness of claim 6> housing consists of the chassis and shielding lid which were made from the conductor, each part of a circuit is arranged on a chassis, and electromagnetic electric shielding is performed by setting a shielding lid. Moreover, the height is prepared in the part which faces a digital signal conversion circuit, and spatial sealing is achieved.

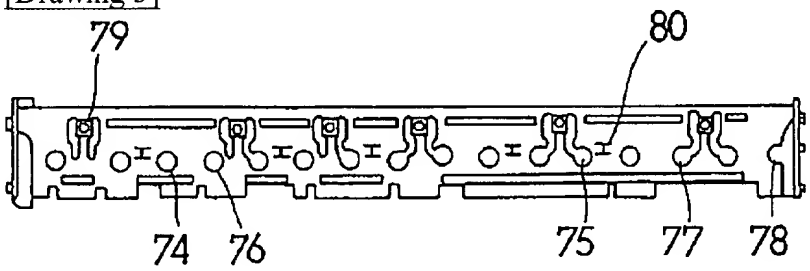
[Translation done.]

* NOTICES *

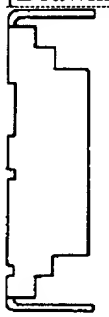
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

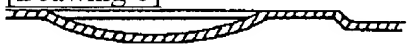
[Drawing 3]



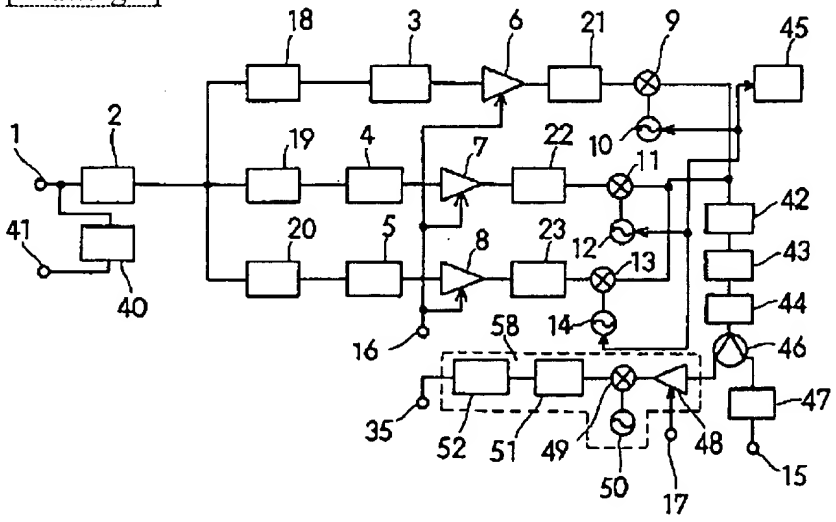
[Drawing 5]



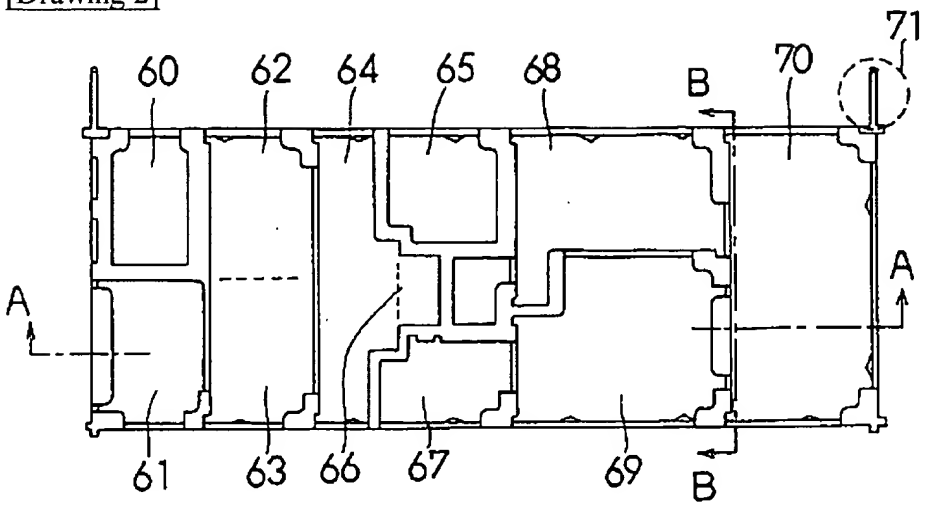
[Drawing 8]



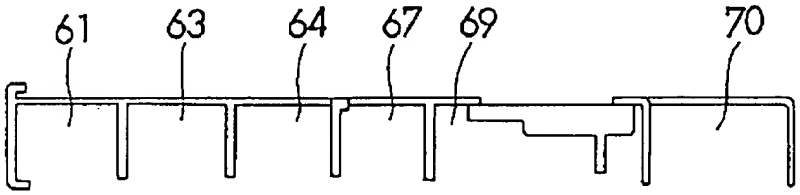
[Drawing 1]



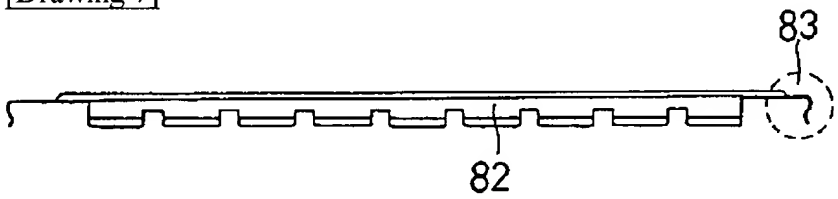
[Drawing 2]



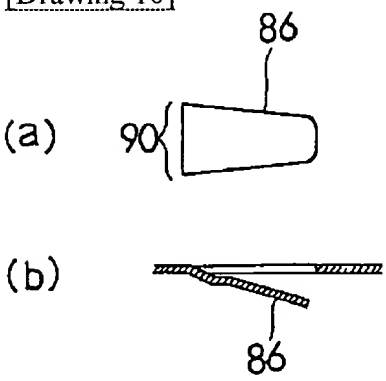
[Drawing 4]



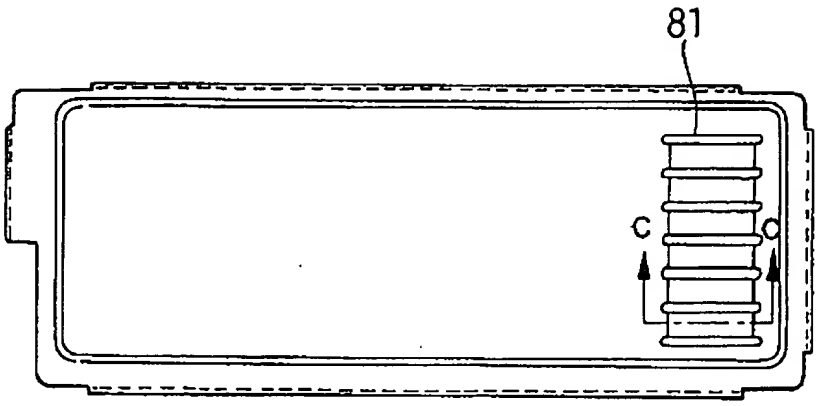
[Drawing 7]



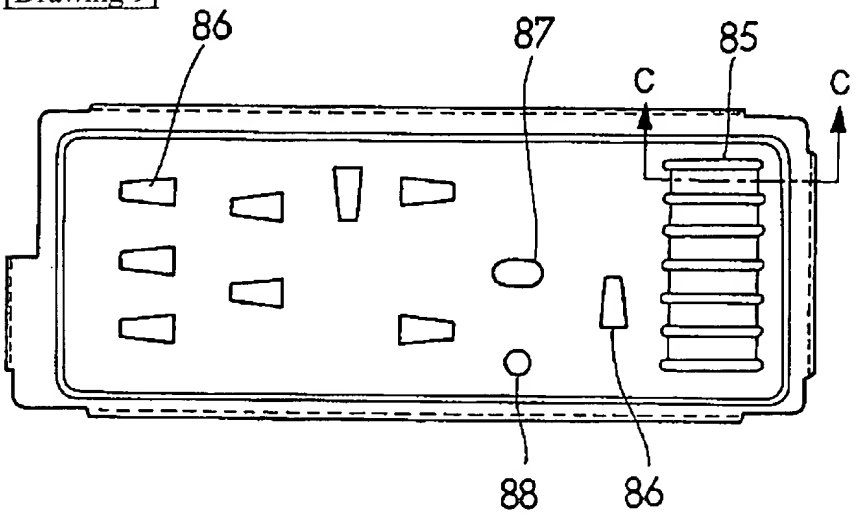
[Drawing 10]



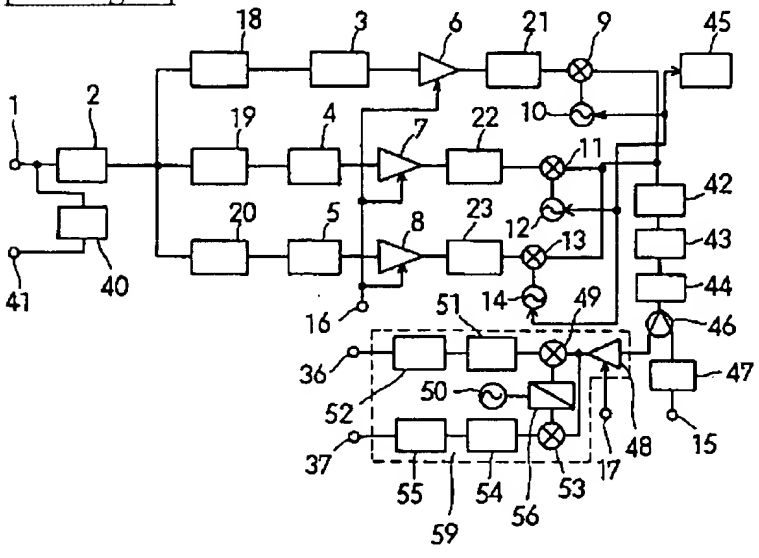
[Drawing 6]



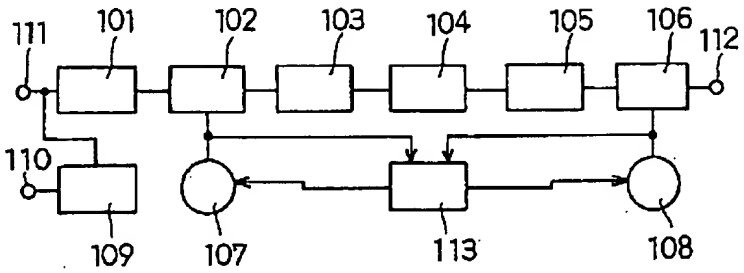
[Drawing 9]



[Drawing 11]



[Drawing 12]



[Translation done.]